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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11515-3 (1986): Fixed Metallised Polycarbonate Film
Dielectric Capacitors, Part 3: Type FCCM 2 [LITD 5:
Semiconductor and Other Electronic Components and Devices]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR
FIXED METALLISED POLYCARBONATE FILM
DIELECTRIC CAPACITORS

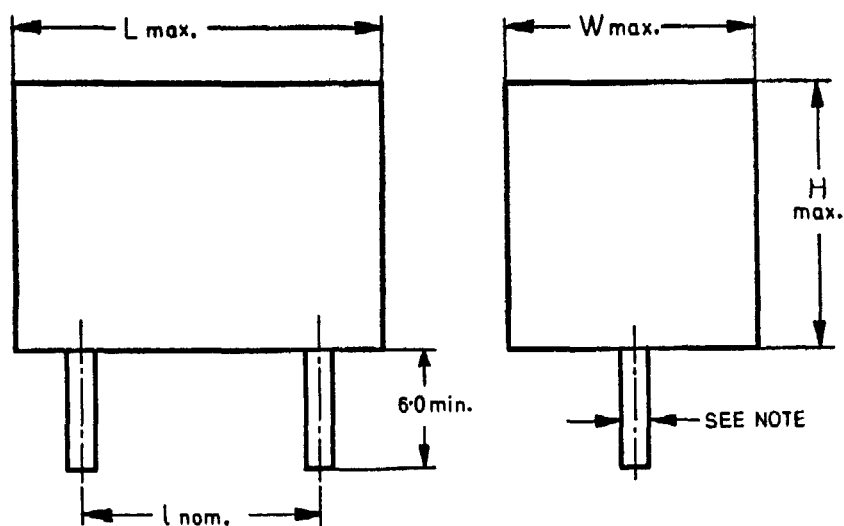
PART 3 TYPE FCCM2

1. Scope

1.1 This standard (Part 3) covers fixed metallised polycarbonate capacitors, rectangular (box type) non-hermitically sealed, insulated, plastic encased, moulded or epoxy filled, radial lead configuration.

1.2 This standard (Part 3) shall be read in conjunction with IS : 11515 (Part 1)-1985 'Specification for fixed metallized polycarbonate film dielectric capacitors: Part 1 General requirements and methods of tests'.

2. Outline, Drawing and Dimensions — The outline drawing and dimensions shall be according to Fig. 1 and Table 1.



Typical construction : Non-hermetically sealed, plastic encased moulded or epoxy filled.

Note — Termination diameters are $0.80^{+0.08}_{-0.05}$ mm for all the case sizes.

FIG. 1 OUTLINE DRAWING AND DIMENSIONS

3. Ratings — Ratings shall be as specified in Table 1.

4. Characteristics :

| | |
|-----------------------------|---|
| a) Selection tolerance | : ± 2 percent, ± 5 percent, ± 10 percent, ± 20 percent |
| b) Stability | : ± 3 percent |
| c) Vibration | : 10—2 000 Hz, 200m/s ² |
| d) Bump | : 4 000, 400 m/s ² |
| e) Low air pressure | : 1 kPa |
| f) Climatic category | : 55/125/56 |
| g) Temperature co-efficient | : -200 ppm ± 250 ppm |

5. Marking — See 7 of IS : 11515 (Part 1)-1985.

6. Material, Construction and Workmanship — See 5 of IS : 11515 (Part 1) - 1985.

Adopted 10 December 1986

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TABLE 1 DIMENSIONS AND RATING
(Clauses 2 and 3)

| Capaci- tance (μ F) | 63V DC | | | | 100V DC | | | | 250V DC | | | | 400 V DC | | | | 630 V DC | | | |
|-------------------------------------|--------|------|------|------|---------|------|------|------|---------|------|------|------|----------|------|------|------|----------|------|------|------|
| | L | I | H | W | L | I | H | W | L | I | H | W | L | I | H | W | L | I | H | W |
| | Max | Nom | Max | Max | Max | Nom | Max | Max | Max | Nom | Max | Max | Max | Nom | Max | Max | Max | Nom | Max | Max |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) |
| 0.001 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.001 5 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.002 2 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.003 3 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.004 7 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.006 8 | | | | | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 |
| 0.01 | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 |
| 0.015 | | | | | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 |
| 0.022 | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 11.5 | 6.0 |
| 0.033 | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 11.5 | 6.0 | 18 | 15.0 | 12.0 | 6.5 |
| 0.047 | | | | | | | | | 13 | 10.0 | 10.5 | 5.0 | 18 | 15.0 | 11.0 | 5.5 | 18 | 15.0 | 12.0 | 6.5 |
| 0.068 | | | | | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 | 18 | 15.0 | 11.0 | 5.5 | 18 | 15.0 | 14.0 | 7.5 |
| 0.10 | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 | 18 | 15.0 | 11.0 | 5.5 | 18 | 15.0 | 12.0 | 6.5 | 27 | 22.5 | 15.5 | 6.5 |
| 0.15 | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 10.5 | 5.0 | 18 | 15.0 | 12.0 | 6.5 | 18 | 15.0 | 14.0 | 7.5 | 27 | 22.5 | 18.5 | 8.5 |
| 0.22 | 13 | 10.0 | 10.5 | 5.0 | 13 | 10.0 | 11.5 | 6.0 | 18 | 15.0 | 13.0 | 7.0 | 27 | 22.5 | 15.5 | 6.5 | 27 | 22.5 | 19.0 | 10.5 |
| 0.33 | 13 | 10.0 | 10.5 | 5.0 | 18 | 15.0 | 11.0 | 5.5 | 18 | 15.0 | 15.0 | 9.0 | 27 | 22.5 | 16.5 | 7.5 | 32 | 27.5 | 21.0 | 11.5 |
| 0.47 | 13 | 10.0 | 11.5 | 6.0 | 18 | 15.0 | 12.0 | 6.5 | 27 | 22.5 | 15.5 | 6.5 | 27 | 22.5 | 19.0 | 10.5 | 32 | 27.5 | 24.5 | 14.0 |
| 0.68 | 13 | 10.0 | 11.5 | 6.0 | 18 | 15.0 | 14.0 | 7.5 | 27 | 22.5 | 16.5 | 7.5 | 32 | 27.5 | 21.0 | 11.5 | | | | |
| 1.0 | 18 | 15.0 | 11.0 | 5.5 | 18 | 15.0 | 15.0 | 9.0 | 27 | 22.5 | 19.0 | 9.5 | 32 | 27.5 | 24.5 | 14.0 | | | | |
| 1.5 | 18 | 15.0 | 12.0 | 6.5 | 27 | 22.5 | 16.5 | 7.5 | 32 | 27.5 | 24.5 | 11.5 | | | | | | | | |
| 2.2 | 18 | 15.0 | 14.0 | 7.5 | 27 | 22.5 | 16.5 | 7.5 | 32 | 27.5 | 24.5 | 14.0 | | | | | | | | |
| 3.3 | 27 | 22.5 | 16.5 | 7.5 | 27 | 22.5 | 19.0 | 10.5 | | | | | | | | | | | | |
| 4.7 | 27 | 22.5 | 18.5 | 8.5 | 32 | 27.5 | 21.0 | 11.5 | | | | | | | | | | | | |
| 6.8 | 27 | 22.5 | 20.5 | 10.0 | 32 | 27.5 | 24.5 | 14.0 | | | | | | | | | | | | |
| 10.0 | 32 | 27.5 | 21.0 | 11.5 | | | | | | | | | | | | | | | | |

7. Classification of Tests — See 8.1 of IS : 11515 (Part 1)-1985.**7.1 General Conditions for Test** — See 8.2 of IS : 11515 (Part 1)-1985.**7.2 Schedule of Type Tests** — The sequence of type tests and requirements shall be in accordance with Table 2.**TABLE 2 TEST SCHEDULE AND REQUIREMENTS**

| SI No. | Test | Clause Ref in IS : 11515 (Part 1)-1985 | Requirement |
|---------------------------------|------|--|---|
| (1) | (2) | (3) | (4) |
| I) <i>Group 0</i> | | | |
| a) Visual examination | | 8.4.1 | The condition, workmanship and finish shall be satisfactory. Marking shall be legible. |
| b) Dimensions | | 8.4.2 | The dimensions of the capacitors and their terminations shall be in accordance with Table 1 and Fig. 1. |
| c) Capacitance | | 8.3.2 | The capacitance value shall correspond with the rated capacitance value taking into account the tolerance. |
| d) Tangent of loss angle | | 8.3.3 Frequency 1 kHz | As in 8.3.3.2 of IS : 11515 (Part 1)-1985 |
| e) Voltage proof | | 8.3.1 | There shall be no breakdown, or flashover. |
| f) Insulation resistance | | 8.3.4 | As in 8.3.4.3 of IS : 11515 (Part 1)-1985. |
| II) <i>Sub-Group 1A</i> | | | |
| a) Initial measurements | | | |
| 1) Capacitance | | | |
| 2) Tangent of loss angle | | | |
| | | For $C_R > 1 \mu\text{F}$: at 1 kHz $C_R \leq 1 \mu\text{F}$: at 10 kHz | |
| b) Robustness of terminations | | 8.4.3 | |
| 1) Visual examination | | 8.4.1 | There shall be no visible damage. |
| c) Resistance to soldering heat | | 8.4.4.2 | |
| | | No predrying | |
| 1) Visual examination | | 8.4.1 | There shall be no damage |
| 2) Capacitance | | 8.3.2 | $\frac{\Delta C}{C} \leq 1$ percent for Grade 1 ≤ 2 percent for Grade 2 of value measured in (a) above. |
| 3) Tangent of Loss angle | | 8.3.3 | Increase of Tan δ : ≤ 0.003 for $C_R \leq 1 \mu\text{F}$ Grade 1 ≤ 0.002 for $C_R > 1 \mu\text{F}$ Grade 1 ≤ 0.005 for $C_R \leq 1 \mu\text{F}$ Grade 2 ≤ 0.003 for $C_R > 1 \mu\text{F}$ Grade 2 Compared to tan δ measured in (a) above. |
| III) <i>Sub-Group 1B</i> | | | |
| a) Solderability | | 8.4.4.1 | Good tinning as evidenced by free flowing of the solder with wetting of the terminations. |
| b) Initial measurements | | | |
| 1) Capacitance | | | |
| 2) Tangent of loss angle | | For $C_R > 1 \mu\text{F}$: at 1 kHz $C_R \leq 1 \mu\text{F}$: at 10 kHz | |

(Continued)

TABLE 2 TEST SCHEDULE AND REQUIREMENTS — (Contd)

| SI No. | Test | Clause Ref. in IS : 11515 (Part 1)-1985 | Requirement |
|--------|--|---|--|
| (1) | (2) | (3) | (4) |
| | c) Rapid change of Temperature | 8.5.3 $\theta A = -55^{\circ}\text{C}$ $\theta B = +125^{\circ}\text{C}$ No. of cycles 5 Duration $\delta = 30$ minutes | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage |
| | d) Vibration | 8.4.5 10–2 000 Hz 200m/s ² Duration — 6h | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage |
| | e) Bump | 8.4.6 Number of Bumps — 4 000 Acceleration — 400 m/s ² | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage |
| | 2) Capacitance | 8.3.2 | $\frac{\Delta C}{C} \leq 2.5\%$ for Grade 1 $\leq 4\%$ for Grade 2 of the values measured in (B) above. |
| | 3) Tangent of loss angle | 8.3.3 | Increase of $\tan \delta$ ≤ 0.003 for $C_R \leq 1 \mu\text{F}$ Grade 1 ≤ 0.002 for $C_R > 1 \mu\text{F}$ Grade 1 ≤ 0.005 for $C_R \leq 1 \mu\text{F}$ Grade 2 ≤ 0.003 for $C_R > 1 \mu\text{F}$ Grade 2 Compared to values measured in (b) above. |
| | 4) Insulation resistance | 8.3.4 | IR shall be $> 50\%$ of values given in I(f). |
| IV) | Group 1 | | |
| | a) Climatic Sequence | 8.5.1 | |
| | 1) Dry heat | 8.5.1.2 Temperature $+125^{\circ}\text{C}$ Duration 16 h | |
| | 2) Damp heat cyclic first cycle | 8.5.1.3 | |
| | 3) Cold | 8.5.1.4 Temperature -55°C Duration 2 h | |
| | 4) Low air pressure | 8.5.1.5 1 kpa | |
| | i) Visual examination | 8.4.1 | There shall be no permanent break down, flashover or harmful deformation of the case. |
| | 5) Damp heat cyclic (remaining cycles) | 8.5.1.6 | |
| | b) Final measurements | | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage. Marking shall be legible. |
| | 2) Capacitance | 8.3.2 | $\frac{\Delta C}{C} \leq 3\%$ for Grade 1 $\leq 5\%$ for Grade 2 of the value measured in II (c) (2) or III(e)(2) as applicable. |
| | 3) Tangent of loss angle | 8.3.3 | Increase of $\tan \delta$ ≤ 0.005 for $C_R \leq 1 \mu\text{F}$ Grade 1 ≤ 0.003 for $C_R > 1 \mu\text{F}$ Grade 1 ≤ 0.008 for $C_R \leq 1 \mu\text{F}$ Grade 2 ≤ 0.005 for $C_R > 1 \mu\text{F}$ Grade 2 compared to values measured in II(a) (1) or III(b) (1) as applicable |
| | 4) Insulation Resistance | 8.3.4 | IR shall be greater than 50 percent of the values given in I (f). |

(Continued)

TABLE 2 TEST SCHEDULE AND REQUIREMENTS — (Contd)

| SI No. | Test | Clause Ref in IS : 11515 (Part 1)-1985 | Requirement |
|--------|---|--|---|
| (1) | (2) | (3) | (4) |
| V) | Group 2 | | |
| | a) Damp heat (steady state) | 8.5.2 | |
| | i) Initial measurements | | |
| | 1) Capacitance | 8.3.2 | |
| | 2) Tangent of loss angle | At 1 kHz | |
| | ii) Final measurements | | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage. The marking shall be legible. |
| | 2) Capacitance | 8.3.2 | $\frac{\Delta C}{C} \leq 3$ percent for Grade 1 ≤ 5 percent for Grade 2 of the value measured in a(i) above |
| | 3) Tangent of loss angle | 8.3.3 | Increase of $\tan \delta$: ≤ 0.005 compared to the values measured in a(i) above |
| | 4) Insulation resistance | 8.3.4 | IR shall be ≤ 50 percent of the values given in I(f). |
| VI) | Group 3 | | |
| | a) Endurance | 8.6 | |
| | | Duration | |
| | | Grade 1 — 2 000 h | |
| | | Grade 2 — 1 000 h | |
| | i) Initial measurements | | |
| | 1) Capacitance | 8.3.2 | |
| | 2) Tangent of loss angle | For $C_R > 1 \mu F$ at 1 kHz For $C_R \leq 1 \mu F$ at 10 kHz | |
| | ii) Final measurements | | |
| | 1) Visual examination | 8.4.1 | There shall be no visible damage. The marking shall be legible. |
| | 2) Capacitance | 8.3.2 | $\frac{\Delta C}{C} \leq 3$ percent for Grade 1 ≤ 5 percent for Grade 2 of the values measured in a(i) above. |
| | 3) Tangent of loss angle | 8.3.3 | Increase of $\tan \delta$: ≤ 0.003 for $C_R \leq 1 \mu F$ Grade 1 ≤ 0.002 for $C_R > 1 \mu F$ Grade 1 ≤ 0.005 for $C_R \leq 1 \mu F$ Grade 2 ≤ 0.003 for $C_R > 1 \mu F$ Grade 2 compared in values measured in a(i) above. |
| | 4) Insulation resistance | 8.3.4 | IR shall be > 50 percent of values in I(f). |
| VII) | Group 4 | | |
| | a) Characteristics depending on temperature | 8.3.6 | |
| | 1) Capacitance | 8.3.2 | As in 8.3.6 of IS : 11515 (Part 1)-1985 |
| | 2) Insulation resistance (Grade 1 only) | 8.3.4 | As in 8.3.6 of IS : 11515 (Part 1)-1985 |
| | b) Charge and discharge | | |
| | i) Initial measurements | | |
| | 1) Capacitance | | |
| | 2) Tangent of loss angle | $C_R > 1 \mu F$ at 1 kHz $C_R \leq 1 \mu F$ at 10 kHz | |
| | ii) Final measurements | | |
| | 1) Capacitance | 8.3.2 | $\frac{\Delta C}{C} \leq 2$ percent for Grade 1 ≤ 3 percent for Grade 2 of the value measured in b(i) above |
| | 2) Tangent of loss angle | 8.3.3 | Increase of $\tan \delta$: ≤ 0.003 for $C_R \leq 1 \mu F$ Grade 1 ≤ 0.002 for $C_R > 1 \mu F$ Grade 1 ≤ 0.005 for $C_R \leq 1 \mu F$ Grade 2 ≤ 0.003 for $C_R > 1 \mu F$ Grade 2 Compared to values measured in (b) (i) above. |
| | 3) Insulation Resistance | 8.3.4 | IR shall be > 50 percent of the values in I(f). |